

Daily GLOWBUGS

Digest: V1 #41

via AB4EL Web Digests @ SunSITE

Purpose: building and operating vacuum tube-based QRP rigs

[AB4EL Ham Radio Homepage @ SunSITE](#)

%%%% GlowBugs %%%%% GlowBugs %%%%% GlowBugs %%%%% GlowBugs %%%%%

Subject: glowbugs V1 #41

glowbugs

Saturday, May 24 1997

Volume 01 : Number 041

Date: Fri, 23 May 1997 09:25:18 -0700 (MST)

From: Jeff Duntemann <jeffd@coriolis.com>

Subject: Tube audio power amp with 12V on the plate

Hi gang--

Last night I found myself, egad, with two whole evening hours and no committments. So I trekked out to the shack and threw together an experiment I'd been meaning to try for some time: An audio power amp using a 12V "space charge" tube.

Space charge tubes were late developments, created in the mid-50's to eliminate vibrator power supplies in car radios. They all take 12V on the plate, and considering that they were in use for all of five or six years, they appeared in a multitude of forms and remain abundant to this day. (And cheap! Usually under \$2 even from AES, and a quarter a hamfests.) The actual physics of these tubes remains a little obscure to me. In tetrodes and pentodes, the first grid away from the cathode is the space charge grid, and it functions (I think) like an accelerator anode to get the electrons chugging toward that weakly-charged plate. The control grid is actually the second grid away from the cathode.

I've tinkered with RF amps and converters using these tubes before (and actually have a working IF strip copied out of a car radio circuit in the 1965 RCA tube manual) but never with audio stages. The car radios using these tubes had final audio stages using early power transistors like the 2N301 and some of the proprietary "doorknob" TO-36 PNP germaniums. (Delco made a lot of these and I have quite a few.) Driving such a transistor to a volume that could shout down the road racket took a fair amount of current, and they created a special driver tube that could deliver 30 milliwatts with 12v on the plate.

In one box lot of tubes I got for five bucks was a 12DL8, which is basically a 12K5 driver tetrode and a 12AL5 dual diode in one envelope. I cleared the brush from one of my prototype boards and lashed up an amp in about fifteen minutes. There isn't much to it, according to the specs in

the 1960 RCA tube manual: 12V to the space charge grid, 12V to the filament, and a 2.2 meg resistor from ground to the control grid to provide bias. Bypass the space charge grid. The load resistance is about 800 ohms, so I put a 600 ohm military headset in series with B+ and the plate. I fed a very low level hi-z sine wave audio signal to the control grid through a .05 disk, and blasted myself half deaf.

Then I threw in a 70v line match transformer and ran the B+ through the 1000 ohm (5W) winding, and my comfy 8 ohm headset. Same thing. Very nice output waveform, looks like good clean class A.

This is WAY more volume than headphone operation requires. I hooked up a 3" 8 ohm speaker and found the volume more than adequate for tinkering-in-the-garage-with-the-receiver-on-and-one-ear-open operation.

The 12DL8 is no cheap date, power-wise. The tube drew about 650ma from a 12V supply. The space charge grid alone draws 75-80ma. (The 12K5 has two space charge grid pins, I would guess to spread some of that around the thin wires inside the envelope.) I don't have anything to measure audio power at the dbm level, so it's unclear how much gain the amp has, but the next step is to put a 12AD6 converter together and make an 80m DC receiver.

The whole point of using these tubes has been to create a tube radio you can give to kids or build with kids and not sweat the voltage. If I get the DC receiver working I'll post the circuit on my FTP site and report here.

I don't know what the 12DL8 or 12K5 would do at RF, but it would be worth investigating.

- --73--

- --Jeff Duntemann KG7JF
Scottsdale, Arizona

Date: Fri, 23 May 1997 13:33:32 -0400 (EDT)
From: **rdkeys@csemail.cropsci.ncsu.edu**
Subject: **Looking for Nat. Bureau of Standards Circulars**

While we are on the topic of early radio devices that are becoming the early glowbugs, has anyone got the correct citations to a series of articles (or maybe copies thereof) published by the Bureau of Standards in Circulars series, sometime around 1920-1923, dealing with homebrew radios? There was a xtal set, and a 1 tube detector set, and maybe and audio box and maybe and rf amp box as part of the series, but it has been so long since I have seen them, I can't remember. If I can find the citations, maybe I can get them on interlibrary loan, or get a xerox of them and add them to the Glowbugs archives. I think they would be worthy additions there.

Bob/NA4G

Date: Fri, 23 May 1997 18:09:12 GMT
From: **wrt@eskimo.com (Bill Turner)**
Subject: **Re: Tube audio power amp with 12V on the plate**

[illegible]

VFO stability would probably be enhanced running 12 volts on the plate. Has anyone tried it?

73, Bill W7TI

Date: Fri, 23 May 1997 11:24:16 -0700 (MST)
From: Chris Trask <ctrask@primenet.com>
Subject: Re: Looking for Nat. Bureau of Standards Circulars

On Fri, 23 May 1997 rdkeys@csemail.cropsci.ncsu.edu wrote:

```
> While we are on the topic of early radio devices that are becoming the
> early glowbugs, has anyone got the correct citations to a series of
> articles (or maybe copies thereof) published by the Bureau of Standards
> in Circulars series, sometime around 1920-1923, dealing with homebrew
> radios? There was a xtal set, and a 1 tube detector set, and maybe
> and audio box and maybe and rf amp box as part of the series, but it
> has been so long since I have seen them, I can't remember. If I can
> find the citations, maybe I can get them on interlibrary loan, or get
> a xerox of them and add them to the Glowbugs archives. I think they
> would be worthy additions there.
>
> Bob/NA4G
```


In message Fri, 23 May 1997 13:33:32 -0400 (EDT),
rdkeys@csemail.cropsci.ncsu.edu writes:

> While we are on the topic of early radio devices that are becoming the
> early glowbugs, has anyone got the correct citations to a series of
> articles (or maybe copies thereof) published by the Bureau of Standards
> in Circulars series, sometime around 1920-1923, dealing with homebrew
> radios?

Well Bob--Just ask. We have all of the Circulars here in the NBS/NIST
library. I can copy anything you need. However there are a lot of Circulars
so if you could narrow it down it'll help. It's only about 200 ft for me to
go to the library so most any day at lunch I can start the search. 73 Jim
K4CGY

Date: Fri, 23 May 1997 13:11:25 -0700 (MST)
From: Jeff Duntemann <jeffd@coriolis.com>
Subject: Re: Tube audio power amp with 12V on the plate

At 11:26 AM 5/23/97 -0700, Ken Gordon wrote:

>Snazzy, Jeff!!! I would be really interested in any circuits you come up
>with.

>

>Kenneth G. Gordon W7EKB

College of Mines and Earth Resources

Here's the plan: I want a homebrew superhet real bad, and have a very nice
aluminum chassis complete with National Velvet Vernier and NOS 50 pf
constant-frequency variable, all ready and waiting to be stuffed. I
started prototyping using "normal" tubes, and then wondered if I could pull
one off using space charge tubes when I bought a box of odd tubes that had
about 15 space charge tubes in it. (How many of us learn new things
playing with junk found hiding in the bottom of a box of other junk
obtained at hamfests?)

I'm prototyping an 80m DC version of the receiver first, using three tubes.
(12EK6 RF, 12AD6 converter, 12K5 audio.) Assuming it works (I've done those
before in sand state) I'm going to make a PC board for it, which will be my
first PC board project using tubes. Then, building on my experience, I'm
going to add an IF strip and make it a true superhet. One thing I'm going
to try there is using those little Murata crystal IF filters, which Johnson
Shop Products is now selling at 4/\$1. Not real period, but WAY cheap
compared to "the real thing" from AES. (Tri-Tech here in Phoenix has
similar crystal filters for 50c each. Digi-Key sells them for \$5. It pays
BIG to shop...)

Once I get a superhet design perfected, I'm going to build on it and make
it dual-conversion for the higher bands. All of these will be PC boards.
But the *last* one will be hand-wired the good ol' way on my aluminum chassis.

I have a couple of old articles from the 50's that have provided valuable
design assistance and circuits.

I'll post all circuits to my FTP site as I get them whipped and report here.

- --73--

- --Jeff Duntemann KG7JF

Scottsdale, Arizona

Date: Fri, 23 May 1997 14:07:46 -0700 (PDT)
From: Ken Gordon <keng@uidaho.edu>
Subject: Re: Looking for Nat. Bureau of Standards Circulars

>
> One that you might look for is Circular #138, which is a decimal
> classification of radio-related subjects which was issued in the early
> to mid-1920's. The Library of Congress has a number of copies, but you
> have to go there in person to see it, so I'm told.

Actually, the LOC DOES have a policy concerning inter-library loan, and it can be done. However, you MAY NOT take the books out of the library which has requested them. You must examine and read them there. I know this is a fact because I have done it. You should probably write or call the LOC to find out there policy on this, because most libraries will tell you it cannot be done.

Ken W7EKB

Date: Fri, 23 May 1997 14:14:10 -0700 (PDT)
From: Ken Gordon <keng@uidaho.edu>
Subject: Re: Tube audio power amp with 12V on the plate

> going to add an IF strip and make it a true superhet. One thing I'm going
> to try there is using those little Murata crystal IF filters, which Johnson
> Shop Products is now selling at 4/\$1. Not real period, but WAY cheap
> compared to "the real thing" from AES. (Tri-Tech here in Phoenix has
> similar crystal filters for 50c each. Digi-Key sells them for \$5. It pays
> BIG to shop...)

So what is Johnson Shop Product's address??????? :-)

Date: Fri, 23 May 1997 14:37:25 -0700 (MST)
From: Jeff Duntemann <jeffd@coriolis.com>
Subject: Johnson Shop Products (was Re: Tube audio power amp with 12V on the plate)

At 02:14 PM 5/23/97 -0700, Ken Gordon wrote:

>> going to add an IF strip and make it a true superhet. One thing I'm going
>> to try there is using those little Murata crystal IF filters, which Johnson
>> Shop Products is now selling at 4/\$1. Not real period, but WAY cheap
>> compared to "the real thing" from AES. (Tri-Tech here in Phoenix has
>> similar crystal filters for 50c each. Digi-Key sells them for \$5. It pays
>> BIG to shop...)

>
>So what is Johnson Shop Product's address??????? :-)

Johnson Shop Products
PO Box 2843
Cupertino CA 95015

408-257-8614
408-253-6288 FAX

This is a catalog worth having. Modern surplus, virtually nothing NOS or glowbuggish. Resistors, toroids (much cheaper than other places, if not so complete a selection) resistors, caps, coils, transformers, switches, wire, and mondo "none of the above." For example, his latest catalog shows a selection of used Simpson 3.5" panel meters that includes a both 500maDC meter and a (rare) 750maDC for \$8.50 each. Not hamfest pricing, quite...but consider what you're getting. (And where do you go for a 750ma panel meter when you want one anyway?)

Same page: 80 megohm 7.5W resistors--perfect for a BIG regen, according to NA4G. \$2.

Elsewhere in the catalog is a 20 Mhz 3.5 watt RF source for \$10. I ordered one yesterday just to see if I could coerce it to 21 Mhz. (What's a piddly Mhz at those frequencies?) Same page: 3.6864 crystals, 60c.

Anyway. You get the idea. I've ordered any number of times from him and have never had any problems.

Definitely keep his catalog on file.

- --73--

- --Jeff Duntemann KG7JF
Scottsdale, Arizona

Date: Fri, 23 May 1997 18:27:46 -0400 (EDT)
From: rdkeys@csemail.cropsci.ncsu.edu
Subject: Re: Tube audio power amp with 12V on the plate

> Here's the plan: I want a homebrew superhet real bad, and have a very nice
> aluminum chassis complete with National Velvet Vernier and NOS 50 pf
> constant-frequency variable, all ready and waiting to be stuffed. I
> started prototyping using "normal" tubes, and then wondered if I could pull
> one off using space charge tubes when I bought a box of odd tubes that had
> about 15 space charge tubes in it. (How many of us learn new things
> playing with junk found hiding in the bottom of a box of other junk
> obtained at hamfests?)

When I was a novice and did not know any better, I took an old Hammarlund HQ-125 (the military RBG), and had it running on 28vdc plates and filaments. Worked fine that way. I could never quite get it going on 12vdc, but then, I was just a novice. Later I built plugin modules using octal plugs and dropped fet's in it, and became dissatisfied, and put the tubes back. It ran for a long time on 28vdc.

It merely required bypassing the series dropping resistors everywhere, and a touch on the biasing cathode resistors to get it to work. I got real good at dropping in jumpers across series dropping resistors.

I had the RAL running the same way one time on 28vdc. That works, too, but requires a little help in the feedback on the detector below around 36 volts or so.

The basic principle should follow to any design at 28vdc. At 12vdc, it would take some more fiddling to get all set right. Using the 12v auto tubes would be a good plan.

Great Ideas There Jeff..... Go for it!

Bob/NA4G

Date: Fri, 23 May 1997 18:04:36 -0500

From: "Robert M. Bratcher Jr." <bratcher@worldnet.att.net>

Subject: Re: Looking for Nat. Bureau of Standards Circulars

At 09:07 PM 5/23/97 +0000, you wrote:

>>

>> One that you might look for is Circular #138, which is a decimal
>> classification of radio-related subjects which was issued in the early
>> to mid-1920's. The Library of Congress has a number of copies, but you
>> have to go there in person to see it, so I'm told.

>

>Actually, the LOC DOES have a policy concerning inter-library loan, and it
>can be done. However, you MAY NOT take the books out of the library which
>has requested them. You must examine and read them there. I know this is
>a fact because I have done it. You should probably write or call the LOC
>to find out there policy on this, because most libraries will tell you it
>cannot be done.

>

>Ken W7EKB

How do I find out what radio books the LOC has?

Robert M. Bratcher Jr.

E-mail to:

bratcher@worldnet.att.net

Record collector, 8mm, super 8, 16 and 35mm Film collector.

Looking for prerecorded reel to reel tape albums.

I like old radio's too.

Collins, Hallicrafters, National & Hammurland are my Favorites!

Date: Fri, 23 May 1997 17:27:09 -0700 (PDT)

From: Ken Gordon <keng@uidaho.edu>

Subject: Re: Looking for Nat. Bureau of Standards Circulars

> How do I find out what radio books the LOC has?

>

Well, the easiest way is to already have the title and call them up and ask them. Another way is to visit their web site and look for yourself, although they probably do NOT have all their books listed there yet (most libraries don't) They have a very active "presence" on the web.

You can also use telnet to get to them at LOC.LOCIS.GOV.

I don't have their URL, but it should be easy to get via a search engine.

Ken W7EKB

Date: Fri, 23 May 1997 17:40:59 -0800
From: "Kenneth G. Gordon" <keng@uidaho.edu>
Subject: More on ECO...

Boy, am I dumb!

After I quoted the short article from the RSGB handbook, someone here mentioned from Tremer's book that since the frequency drift with changes in anode voltages is opposite to that caused by changes in screen voltage.

Here is a similar quote from the RSGB handbook on the same subject:

" A valuable property of the electron-coupled oscillator circuit is that the frequency variation for a given change in anode voltage is found to be of opposite sign to that caused by a similar change of screen voltage as shown in Fig. 6.22.

If the relative values of these two voltages are carefully chosen the effect of one electrode can be made to balance that of the other over quite a large range when the two voltages are supplied from a common source. " Then follows the previous quote about suppressor grids.

The Fig. 6.22 mentioned is a graph of frequency variation versus voltage change for both plate and screen and the resultant when you proportion them properly.

This is all on page 6.13 of the 1972 edition of the RSGB "Radio Communication Handbook", under the heading, "V.F.O. Circuits" and the subheading, "The Electron-coupled Oscillator."

Ken W7EKB

Date: Fri, 23 May 1997 20:26:13 -0700 (PDT)
From: Jacqueline Herman <jherman@sierra.net>
Subject: Re: WTB Heath AT-1

On Fri, 23 May 1997, Robert Friess wrote:

> I am looking for a really nice AT-1 to add to my collection. I am
> willing to pay a premium price for a really exceptional unit. Is
> anything out there?

Was looking at a recent QST article about Heath; the AT-1 went for \$29.50 back in 195?. Oh, to be able to buy an unbuilt AT-1 for that price today....

Jeff KH2PZ / 7

Date: Fri, 23 May 1997 21:30:07 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>

Subject: Re: Boatanchor Bob's Tin Can Report

On Fri, 23 May 1997 rdkeys@csemail.cropsci.ncsu.edu wrote:

> left there. Different sets of tin cans were tried and rated on a 4 point
> scale according to the following table:
>

Interesting and a little suprising. I expected the ANB-1 receivers to be poor since they are low impedance - but would have expected the R-14's to be much better, expecting higher impedance to load the xtal less and have higher volume.

It was a Christmas present of a Cub Scout Crystal Radio Set that started me into electronics - they came with a single R-14 receiver to listen with.

>From later experiments, I found the telephone company receivers (operators headset style) to be much more sensitive than the military elements I had - never had storebought Trimms for comparison. Be interesting to see how they compare to the Baldwins, etc.

John Kolb KK6IL

Date: Sat, 24 May 1997 14:13:55 -0400 (EDT)
From: EWoodman@aol.com
Subject: Re: Boatanchor Bob's Tin Can Report

Just tried out another set of Trimms that I dug out from storage. I think they were a set we used to use at work with a receiver for tracing underground cable. We would inject a signal at one end of the cable and use the receiver with a pick-up coil to follow it along. That piece of equipment was probably from back in the early 40's. Anyway, these phones are labeled as Type K. Look to be really well made. The cans are metal with the usual screw-on covers and VERY heavy compared to my others. The headset is fully adjustable with set screws, etc. I had forgotten I had them. Last night I compared them with my Trimm Dependables. Wow, what a difference. Subjectively I'd say the volume more than doubled. Couldn't believe it. Anybody have a pair of these that they use?

73 Eric KA1YRV

End of glowbugs V1 #41

%%%% GlowBugs %%%%% GlowBugs %%%%% GlowBugs %%%%% GlowBugs %%%%%

[AB4EL Ham Radio Homepage @ SunSITE](#)

Created by Steve Modena, AB4EL

Comments and suggestions to **modena@SunSITE.unc.edu**
